

Serial No. - 09/808,864
Art Unit - 2823
Docket No. - MIO 0079 PA/40509.148

Remarks

Claims 41-48 are new. No new matter has been entered. Accordingly, claims 1-8, 10, 11, 13-16, 21-28, 31, 33, 34, 36-48 are pending in this application.

In the latest Office Action, claims 1-3, 6-8, 10, 11, 13-16, 21-26, 31, 33, 34, 36, 37, and 38-40 have been rejected by the examiner under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (AAPA) in combination with Kizilyalli (6,174,807), and Shibata (5,023,679) or Liu (6,121,124). Additionally, claims 4, 5, 27, 28, 34, and 37 have been rejected by the examiner under 35 U.S.C. 103(a) as being unpatentable Applicant Admitted Prior Art (AAPA) in combination with Kizilyalli (6,174,807), and Shibata (5,023,679) or Liu (6,121,124) as applied to claims 1-3, 6-8, 10, 11, 13-16, 21-26, 31, 33, 34, 36, 37, and 38-40, and in further in view of Fuji et al. (5,355,010). The applicants respectfully traverse these rejections for the following reasons.

In rejecting the claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. See *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). A prima facie case of obviousness is established by presenting evidence that would have led one of ordinary skill in the art to combine the relevant teachings of the references to arrive at the claimed invention. See *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) and *In re Lintner*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

In reviewing the office action, the examiner has combined the teachings of a number of references in order to reach a conclusion of obviousness. When an obviousness determination is based on multiple prior art references, there must be a showing of some "teaching, suggestion, or reason" to combine the references. Evidence of a suggestion, teaching, or motivation to combine prior art references may flow, inter alia, from the references themselves, the knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved. Although a reference need not expressly teach that the disclosure contained therein should be combined with another, the showing of combinability, in whatever form, must nevertheless be "clear and particular." *Winner International Royalty Corp. v. Wang*, 202 F.3d 1340, 53 USPQ2d 1580 (Fed. Cir. 2000).

Serial No. - 09/808,864
Art Unit - 2823
Docket No. - MIO 0079 PA/40509.148

The applicants are aware that most if not all inventions arise from a combination of old elements. See *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See *id.* However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See *id.* Lastly, in determining obviousness/nonobviousness, an invention must be considered "as a whole," 35 U.S.C. § 103, and claims must be considered in their entirety. *Medtronic, Inc. v. Cardiac Pacemakers, Inc.*, 721 F.2d 1563, 1567, 220 USPQ 97, 101 (Fed. Cir. 1983).

In the Office Action, the Examiner asserts that it would have been within the scope of one of ordinary skill in the art to form the barrier [layer] over the P+ region of the gate layer, as recited, in view of Kizilyalli disclosing the formation of the barrier layer over the N+ region of the gate layer, Shibata and Liu disclosing using an oxide as a barrier layer, and Liu also disclosing that the barrier layer is useful when placed over the P+ region of the gate layer. We respectfully disagree.

In our view, it would not have been obvious at the time the invention was made to a person of ordinary skill in the art to have modified the AAPA in combination with Kizilyalli and in view of Shibata or Liu to arrive at the subject matter of claims 1-3, 6-8, 10, 11, 13-16, 21-26, 31, 33, 34, 36, 37, and 38-40. In that regard, the invention when considered "as a whole" as required by 35 U.S.C. § 103 is not suggested by the applied prior art.

In a previous Office Action, the examiner agrees that the combination of AAPA and Kizilyalli et al. fails to teach or suggest the limitation of an oxide diffusion barrier layer as recited by the claims. It is the examiner's contention that Shibata or Liu cure this deficiency as allegedly teaching the use an oxide layer interposed between a polysilicon layer and a metalized layer in the manner recited by the claims.

However, when Shibata is read as a whole, one skilled in the art recognizes that Shibata discloses a polysilicon/silicon, oxide/metal silicide gate electrode of a single MOSFET with a polysilicon sidewall spacer strapping the doped polysilicon gate conductor and the lower resistivity silicide film. The oxide layer functions as a diffusion barrier to prevent metal atoms in the overlaying metal or metal silicide layer of the MOSFET gate electrode diffusing through the poly layer into the gate oxide layer. See col. 2, lines 28-31.

Serial No. - 09/808,864
Art Unit - 2823
Docket No. - MIO 0079 PA/40509.148

Accordingly, Shibata fails to teach or suggest that their diffusion barrier would also be useful to prevent lateral diffusion of a dopant between a dual-doped polysilicon having an overlaying metal or metal silicide layer as is the object of Kizilyalli. Nor does Shibata teach or suggest that their oxide diffusion barrier is a suitable replacement for a nitrogen or argon doped barrier region, such as used by Kizilyalli. Accordingly, Shibata fails to provide the motivation to modify the AAPA in combination with Kizilyalli as suggested by the examiner to produce the claimed invention.

Even if one skilled in the art did combine the teachings of Shibata with the AAPA and Kizilyalli, the resulting combination would fail to produce the recited invention. In particular and as illustrated by provided Exhibit A, the resulting semiconductive device would be the AAPA structure (FIG. 2 without layer 28 of the present invention) having the N⁺ poly layer 21 doped near its upper surface with either nitrogen or argon to form the diffusion barrier region 50 of Kizilyalli, and the conductive gate 10 of the NMOS 11 and PMOS 12 with the diffusion barrier 8 of Shibata.

Liu is cited for teaching also the use of an oxide layer between a polysilicon layer and a metal or metal silicide layer. Liu discloses in col. 2, lines 43-47, that this assertion is in reference to Tsukamoto, M., et al., "0.25 μ m W-Polycide Dual Gate and Buried Metal on Diffusion Layer (BMD) Technology for DRAM-Embedded Logic Devices," 1997 Symposium on VLSI Technology Digest of Technical Papers, pp. 23-24 (1997)(hereafter "Tsukamoto"). As Liu is summarizing the works of Tsukamoto, one skilled in the art would refer to the article for further guidance. The Tsukamoto reference has been provided to the examiner in a supplemental information disclosure statement for consideration.

As clearly pointed out by Tsukamoto, the formation of the oxide layer by chemical oxidation is for the purpose of large-grain polysilicon (LGP) growth, and not as a diffusion barrier layer. For this reason, Tsukamoto teaches that the oxide formation occurs after the deposition of a first polysilicon layer, and which is followed by deposition of an amorphous silicon layer for the LGP growth. Tsukamoto reports it is the LGP which prevents fluorine diffusion from WSix, and not the oxide layer. See col. 2, lines 19-20.

Furthermore, even if one skilled in the art did combine the teachings of Liu (in view of Tsukamoto) with the AAPA and Kizilyalli, the resulting combination would fail to produce

Serial No. - 09/808,864
Art Unit - 2823
Docket No. - MIO 0079 PA/40509.148

the recited invention. In particular and as illustrated by provided Exhibit B, the resulting semiconductive device would be the AAPA structure (FIG. 2 without layer 28 of the present invention) having the N+ poly layer 21 doped near its upper surface with either nitrogen or argon to form the diffusion barrier region 50 of Kizilyalli, wherein poly layers 21 and 22 would have the LGP/oxide/polysilicon structure of Liu in view of Tsukamoto. However, as Tsukamoto mentions nitrogen implantation as a prior art method, one skilled in the art would most likely not include the dope region 50 of Kizilyalli since viewing Tsukamoto as an alternative to the process of Kizilyalli.

Accordingly, even though there is no motivation, the AAPA in combination with Kizilyalli and in view of Shibata or Liu fails to teach or suggest, inter alia, the limitation of "an oxide diffusion barrier layer formed in said polysilicide gate electrode structure on a portion of said polycrystalline silicon film between said polycrystalline silicon film and said metal, metal silicide, or metal nitride film, and over only a portion of said isolation region" as recited by independent claims 1-8, 10, 11, 13-16, 31 and 40.

Fuji et al. is cited for disclosing a CMOS structure, and therefore the suggested combination of references for same reason noted above does not disclosed the recited limitations of independent claims 4 and 5. As claims 27, 34 and 37 depend from unobvious independent claims, these claims are also believed allowable.

New claims 41-48 present embodiments not previously noted by the applicants and for which protection is desired. In view of the cited art and above remarks, applicants further believe that these new claims are also unanticipated and unobvious. In particular, none of the cited art suggest, inter alia, the limitation of "an oxide layer formed between and in contact with both said first and second layers, wherein said oxide layer is noncoplanar with said first layer and extends over at least a portion of the isolation region" as recited by new claim 41 or the limitation of "an oxide layer formed between and in contact with both said polycrystalline silicon layer and said a metal, metal silicide, or metal nitride film layer, wherein said oxide layer is noncoplanar with said polycrystalline silicon layer and extends over at least a portion of said isolation region" as recited by new claim 48.

Applicants respectfully submit that, in view of the above remarks the application is now in condition for allowance. The Examiner is encouraged to contact the undersigned to


Serial No. - 09/808,864
Art Unit - 2823
Docket No. - MIO 0079 PA/40509.148

resolve efficiently any formal matters or to discuss any aspects of the application or of this response. Otherwise, early notification of allowable subject matter is respectfully solicited.

Respectfully submitted,

DINSMORE & SHOHL, L.L.P.

By



William A. Jividen
Registration No. 42,695

One Dayton Centre
One South Main Street, Suite 500
Dayton, Ohio 45402-2023
Telephone: (937) 223-2050
Facsimile: (937) 223-0724
e-mail: william.jividen@dinslaw.com